F.M. 28

UNITED STATES DEPARTMENT OF AGRICULTURE

Bureau of Agricultural Economics
in cooperation with
The Mississippi Agricultural Extension Service
and Experiment Station

SOYBEANS IN BRIEF

A War Crop for Delta Farmers

THE PER-ACRE PICTURE

	Soybeans	Corn	Oats
Gross value of crop	$28.00	$17.50	$24.00
Direct expenses	10.77	8.28	11.03
Difference	17.23	9.22	12.97

Little Rock, Arkansas
January, 1942

A FOOD FOR FREEDOM SHORT

ACKNOWLEDGMENT

This report was prepared by farm management specialists of the Bureau of Agricultural Economics, with the cooperation of the Mississippi Agricultural Experiment Station and Extension Service. Appreciation is here expressed for the cooperation of farmers, who provided much of the information upon which this report is based.

PREFACE

In order to help supply the vegetable-oil requirements of this country and its allies in 1942, a substantial increase is needed in the production of soybeans. As is true of any rapidly expanding farm enterprise, encouragement of an abrupt increase in the production of soybeans is fraught with many problems of production and disposal. However, these hazards can be minimized and production goals can be most readily attained if expansion is encouraged in those areas where circumstances and past experience indicate favorable opportunities for success.

The Mississippi Delta is an area in which it appears that farmers can profitably make a large increase in the production of soybeans for oil in 1942. Some farmers in the Delta already have one or more years of experience with the crop. Moreover, the Experiment Stations have the results of several years of work upon which to base conclusions concerning cultural practices and selection of varieties.

This report summarizes the experience of 50 farmers who have produced soybeans for oil, the results of Experiment Station work, and the opinions of Experiment Station and Extension Service workers. The information should prove helpful to present producers as well as to prospective new producers. Although many of these production data are based on information obtained from farmers in the Yazoo-Mississippi Delta, the recommendations and conclusions are generally applicable to delta conditions throughout Arkansas and Louisiana, as well as in Mississippi.

SOYBEANS IN BRIEF: A War Crop for Delta Farmers

By P. S. McComas, Associate Agricultural Economist, and E. L. Langsford, Agricultural Economist

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Soybeans in the War Effort

Fats and oil occupy an important place in the national war effort, as they furnish a considerable part of the food supply, and are widely used in the production of industrial products and munitions.

Domestic demands for fats and oils are now the greatest in 20 years and further increases are expected during 1942. During the past several years, domestic consumption has exceeded domestic production by about 1.5 billion pounds annually. This deficit has been met by imports, largely from Asia and South America, in the form of coconut, palm, tung and other oils, and in oil-bearing raw materials, the most important being copra, flaxseed, castor beans, and Babassu nuts.

In 1942, domestic needs plus Lend-Lease and other exports are expected to exceed 12 billion pounds, which is about 3 billion pounds greater than estimated domestic production during 1940-41. The imports during 1940-41 were approximately 1.6 billion pounds. Imports in 1942 will be greatly reduced if not completely cut off by the war in the Pacific and a general shortage of shipping facilities. An increase in the domestic production of fats and oils in 1942 is urgently needed to meet wartime requirements and prevent drastic depletion of stocks. Farmers in this country must do their utmost to increase the production of fats and oils. Southern farmers can perhaps make their greatest contribution to this cause by materially increasing the acreage devoted to the production of soybeans and peanuts for oil. 1/

1/ See "Peanut Production for War Needs," U.S.D.A., B.A.E., Exp. Sta. Coop., Processed February 1942, Raleigh, N.C., Griffin, Ga.

Soybeans are well adapted to the southern climate and to many southern soils. They have been grown rather widely for hay and for soil improvement. Many of the upland areas, however, are not well adapted to the use of large-scale harvesting machinery, and most operators of small upland farms may not have access to combines for harvesting beans. Therefore, the soybean acreage, if increased at all in such areas, will be limited mainly to the acreage that can be harvested by hand or by improvised methods.

On the other hand, land in the more level areas as the Mississippi Delta, which is adapted to the production of soybeans, is also well adapted to the use of large-scale machinery. Many farmers already own combines which they are using to harvest oats and many other farmers may find it profitable, under present prices and market outlets, to grow an acreage of soybeans sufficient to justify the purchase of a combine. Another point in favor of increasing soybean acreage in the Delta is that numerous cotton-seed oil mills offering excellent processing facilities are available.

This report deals with the Delta area, and more specifically the Yazoo-Mississippi Delta. 2/

The 1942 acreage goals of soybeans for oil suggested by the Mississippi State Defense Board for these counties was 188,920 acres, which is about 3 times the acreage harvested in 1941. But these goals were established before the declaration of war in the Pacific; therefore, efforts should be made to exceed materially these goals.

The Place of Soybeans in the Delta

Although soybeans have been used as a hay crop in the Delta for many years, they were of minor importance before 1930. In 1929 only about one percent of the cropland was used for soybeans, most of which were used for hay. By 1934 more than 5 percent of the crop acreage was planted to soybeans alone, and a large part of the corn acreage was interplanted with soybeans. Since the development of the Agricultural Conservation program and payments for green-manure crops and interplanted legumes, soybeans have been widely used as a soil-building crop, and have proved very valuable for this purpose. During the period 1930-35, a few Delta farmers harvested seed from hay-type beans and sold seed to their neighbors; however, in 1934, only about 80,000 bushels were harvested for seed. In 1941, it is estimated that approximately 300,000 acres of beans were planted alone, and that about 60,000 acres were harvested for beans. Of this acreage, 45,000 to 50,000 were yellow beans, suitable for oil.

This rather large increase in the acreage of soybeans harvested for grain is due to several factors: (1) The development of high-yielding, early maturing varieties which combine well; (2) the improvement of the small combine and its adaptation to the harvesting of southern beans; (3) the relatively high price of beans in the spring of 1941; and (4) the limitations on cotton acreage.

2/ In this report the following counties are considered Mississippi Delta counties, and statistics presented are for these counties: Bolivar, Coahoma, Holmes, Humphreys, Issaquena, Leflore, Quitman, Sharkey, Sunflower, Tallahatchie, Tunica, Washington, and Yazoo.

Soybeans in the Plantation Organization

Soybeans apparently fit well into the organization of Delta plantations. The enterprise provides a source of cash from land not devoted to cotton production. The production of soybeans is adapted to the use of large-scale machinery, and competes only to a limited extent with cotton for labor during the harvest season, as a relatively small crew can harvest a rather large acreage of beans. The competition for power and machinery is not serious.

The soybean enterprise is supplementary to the oat enterprise (the importance of which has increased rapidly during the last few years) in that the use of the combine for both crops increases the acreage handled and reduces per acre harvesting costs. It is estimated that, if operated to near capacity, there are enough combines in the area to harvest 150,000 to 200,000 acres of soybeans in addition to the present oat acreage.

Soybeans, even when harvested for grain, add organic matter and nitrogen to the soil, as well as increasing soil tilth. Some farmers have expressed the opinion that the yield of oats planted after soybeans is as high as the yield of oats on which nitrogenous fertilizer has been applied at the rate of 150 pounds per acre. With favorable prices, soybeans harvested for grain can be profitably substituted for soybeans turned under and although beans harvested for grain result in somewhat less improvement to the soil than turning under the entire crop, the former practice can be adopted with the assurance that soil will be maintained or improved.

In 1942 the AAA is encouraging the growing of soybeans by including this crop among those which qualify as an erosion resisting or soil conserving crop to meet a minimum acreage requirement for such crops. There is nothing in the AAA program which would discourage the harvesting of soybeans for grain mechanically, as soybeans qualify under the minimum provision mentioned above regardless of the manner in which they are harvested.

Cultural Practices, Labor, and Power Needs

Soybeans for hay or green manure can be planted on poorly drained land, or land infested with weeds and grass, and, although given little attention, will afford some return. This is not the case with soybeans to be harvested for beans. Experiences of farmers who have been successful in production of soybeans for beans indicate that the beans should be planted at the proper time on a well-prepared seedbed, should be cultivated, and kept relatively free of weeds and grass, if satisfactory results are to be obtained.

Most of the farmers interviewed prepared the seedbed about the same as for cotton or corn. Several farmers considered it desirable to flat break the land, particularly land not in good tilth, rather than break with middlebusters as is the usual custom.

Nearly all farmers interviewed used tractors and tractor equipment in preparing the land, planting, cultivating, and harvesting beans.

Practically all farmers interviewed planted their beans in rows with 38 inches the usual width between rows.

The most common practices up to harvest are essentially the same as those used for corn, with one major exception, that only a few of the farmers hoed the beans whereas most operators hoe corn. Those who hoed their beans considered it very essential in that it increased plant growth, caused better fruiting, and materially facilitated combining. Others indicated that they intended to hoe future crops.

The rate of harvesting beans with a 6-foot combine was about 1 acre per hour, but as most beans were harvested at a time when days were short and dews rather heavy, combines were operated only 7 or 8 hours per day. Farmers estimated that from 125 to 200 acres of beans could be harvested in a season with a 6-foot combine. The most common estimate was about 150 acres. A comparable estimate for oats was 200 acres. The 6-foot combine with an auxiliary motor was the most common size in use by the farmers interviewed.

On the basis of the operations usually performed and usual rates of performance, approximately 17 man hours, .5 tractor, and 1 truck hour are needed for the production of an acre of soybeans. This compares with approximately 25 man hours, 4½ tractor hours, and 7 mule hours per acre for corn production, and approximately 7 man hours, 4 tractor hours, and 1 truck hour per acre in oat production (table 1).

Table 1.- Usual operations and man labor and power used per acre in producing soybeans, corn, and oats

Item	Soybeans			Corn			Oats		
	Hours per acre			Hours per acre			Hours per acre		
	Man	Tractor	Truck	Man	Tractor	Mule	Man	Tractor	Truck
Seedbed preparation	2.5	2.5	-	2.5	2.5	-	2.5	2.5	-
Plant	.8	.4	-	.8	.4	-	.8	.4	-
Fertilize	-	-	-	-	-	-	.4	.2	-
Cultivate	1.0	1.0	-	1.5	1.5	-	-	-	-
Hoe	10.0	-	-	10.0	-	-	-	-	-
Harvest	1.8	.9	-	10.0)	-	6.7)	1.6	.8	-
Haul to barn	.8	-	.8	)	-	)	1.6	-	.8
Total	16.9	4.8	.8	24.8	4.4	6.7	6.9	3.9	.8

The seeding rate per acre varied from 40 to 100 pounds, with the most usual rate being about 60 pounds. There was also a wide variation in planting dates among the farmers interviewed; however, most operators agreed that early plantings had the best chances for success, and indicated that April 1 to 15 was perhaps the best planting season.

The varieties of oil beans most commonly planted are Arksoy, Macoupin, Mamloxi, and Mamredo. Of the acreage of beans harvested for grain by farmers interviewed, about 70 percent was in Arksoy, 15 percent in Macoupin, and 15 percent in other varieties, chiefly Mamloxi and Mamredo.

The Arksoy bean is one of the earliest maturing varieties of soybean adapted to the climate and soils of the Yazoo-Mississippi Delta. The regular Arksoy bean matures in about 140 days, whereas the Arksoy #2913 matures a few days earlier. It is an erect-growing bush-type variety, with 2- and 3-seeded pods. It begins fruiting close to the ground, does not shatter badly, and is perhaps the highest yielding variety now commonly grown in the Delta.

The Macoupin is the earliest maturing variety of bean now grown extensively in the Delta, and has a very high oil content. Yields obtained are somewhat less than for Arksoys, and some farmers have complained of poor stands and of varying dates of maturity. It shatters more during harvesting than the Arksoy variety. If a good stand is obtained and maturity is uniform, yields compare favorably with Arksoys. The use of the Macoupin along with the Arksoy spreads the work with the combine over a longer period and allows harvesting to get under way early in September if the beans are planted early in April.

Mamloxi and Mamredo beans are considerably later than Arksoy and Macoupin, and a number of farmers say they do not "combine" well until after frost.

As might be expected, a considerable variation existed in the per acre yields obtained in 1941 and in farmers' estimates of normal yield expectations. In 1941 the yields obtained by the interviewed farmers ranged from almost a complete failure to 35 bushels per acre. The average was slightly over 16 bushels, but nearly one-half the yields were between 20 and 25 bushels. Farmers' estimates of normal yields ranged from 12 to 35 bushels, with about one-third of the estimates between 20 and 25 bushels, and only 8 percent less than 15 bushels.

The more important factors which appeared to be conducive to high yields are: the planting of well-adapted, early and uniform-maturing varieties that do not shatter and that combine well; early planting; proper cultivation, including keeping the growing bean plants free of weeds and grass; and timely harvesting. Several farmers indicated that their yields were reduced considerably because harvesting was delayed.

In general, the Arksoy was considered the most satisfactory variety among the farmers interviewed.

Comparison of Incomes from Soybeans, Corn, and Oats

Patriotic appeals and special adaptability to physical conditions will not, of themselves, give soybeans a prominent place in the agriculture of the Delta, for there are several other crops which are also important in the defense program and fully as well adapted to the physical conditions of the Delta. In the final analysis, the net income from soybeans and from a plantation organization containing the soybean enterprise must compare favorably with competing crops needed in defense and with alternative organizations.

With present prices and yields, cotton has a decided income advantage over other crops on most Delta plantations. At present, however, only about 40 percent of the cropland is devoted to the production of cotton. Thus soybeans are not actually competing with cotton for land, but with other crops for part of the remaining 60 percent of the cropland. Summer legumes turned under unharvested on land suitable for the production of soybeans for beans offer no real competition. Hay crops other than an acreage sufficient to supply the plantation livestock will not furnish much competition on lands with adequate drainage for the production of soybeans for beans. Then the main competition from the cash income standpoint, on most plantations, is from corn and oats. The oats and bean enterprises, however, are actually supplementary as well as competing.

Estimates of per acre gross income, and direct expenses with normal yields and with 1941 prices for soybeans, corn, and oats, are shown in table 2.

As the allocation of management and general overhead expenses to the various enterprises making up a farm organization is difficult, and as such costs per acre would probably be essentially the same for each of these three crops, only those costs which are directly chargeable to each enterprise have been considered. However, the estimates given in table 2 provide a satisfactory basis for comparing the relative profitableness of these three crops, with different yields and price relationships. In making these income computations, the amounts of labor and power considered are the same as those shown in table 1. The costs relating to the tractor, combine, and other machinery, the quantities of seed, fertilizer, and materials, and the prices considered, are shown in table 3.

These estimates of yields, incomes, and costs are based upon averages or normals for several farms. In determining the most profitable crop or combination of crops for 1942, each farmer should use the normal yield and costs on his farm.

Based on yields of 20 bushels of soybeans, 25 bushels of corn, and 60 bushels of oats, and on approximate 1941 farm prices of $1.40, 70 cents, and 40 cents per bushel for soybeans, corn, and oats, respectively, the estimated net-enterprise income per acre (gross value of crop minus direct expenses) is about $17 for soybeans, $9 for corn, and $13 for oats. These differences in net-enterprise income are due largely to the differences in the gross value of the crops, since there is little difference in the ex-

Table 2.- Relative cash values and specified expenses of various crops, per acre, Yazoo-Mississippi Delta

Item	Unit	Soybeans	Corn	Oats
Yield per acre	Bushel	20	25	60
Price per bushel	Dollar	1.40	.70	.40
Gross cash value	do.	28.00	17.50	24.00
Expenses for:				
Labor	Dollar	1.99	2.72	.96
Power	do.	3.62 1/	3.86 2/	3.04 1/
Combine (repairs, depreciation, interest)	do.	1.84	0	1.30
Other machinery	do.	1.17	1.32	.93
Seed	do.	2.00	.38	1.50
Fertilizer	do.	0	0	3.00
Sacks	do.	.15	0	.30
Total	do.	10.77	8.28	11.03
Net enterprise income 3/	Dollar	17.23	9.22	12.97

1/ Includes 50 cents truck expense.
2/ Includes $1.00 for mule work.
3/ These income estimates are cash values minus operating-enterprise expenses. They reflect the relative profitableness of each crop but do not represent net profit, as general overhead expenses have not been considered. Overhead costs per acre, however, are essentially the same for each of these crops.

Table 3.- Estimated costs of power, machinery, seed, fertilizer, and materials used in production of soybeans, oats, and corn, Yazoo-Mississippi Delta

Item	Dollars	Item	Dollars
Cost of operating a tractor, per hour:		Seed, fertilizer, and materials used, per acre:	
Fuel - 2 gal. @ 12¢	.24		
Oil - .2 gal. @ 45¢	.09	Seed:	
Grease - .025 lb. @ 10¢	.0025		
	.3325	Soybeans	
		Bought ½ bu. @ $2.50	1.25
Repairs-($100 per year) 1/	.10	Home grown ½ bu. @ $1.50	.75
Depreciation-$1175 @ 12½% 1/	.1470		2.00
Interest-$1175 @ 6% 1/	.0705		
	.3175	Oats	
Total	.6500	Bought 1/3 of 2½ bu. @ $1	.83
		Home grown 2/3 of 2½ bu. @ .40	.67
			1.50
		Corn	
		Bought ¼ bu. @ $1.50	.38
		Fertilizer for oats, per acre:	
		150# @ $40.00 per ton	3.00
		Sacks per acre:	
		Soybeans	.15
		Oats	.30
		Labor:	
		Tractor driver, per day	1.50
		Other, per day	1.00

Item	Soybeans	Oats
	Dollars	Dollars
Cost of operating a 6-ft. combine, annual:		
Repairs	45	30
Depreciation-15% of $1100	165	165
Interest-6% of $1100	66	66
Total	276	261
Cost per acre 2/	1.84	1.30
Cost of operating tractor machinery, exclusive of combine, per hour, $0.30		

1/ Tractor used 1,000 hours yearly.
2/ Based on 150 acres of soybeans and 200 acres of oats.

penses on soybeans and oats, and the expenses on corn are only $2.50 and $2.75 less than for soybeans and oats respectively.

Yields and prices vary between farms, and from year to year. Too, the yield of oats or corn may be higher relative to soybeans on one farm as compared with the average, and vice versa. In an attempt to obtain a basis for roughly determining the relative profitableness under different yields and price relationships, net-enterprise incomes have been calculated, using varying yields and prices for each crop (table 4). These estimates of net-enterprise income should be considered as rough, because only yields and prices have been varied, and it is entirely probable that with higher prices of products, items of expense would also be higher. But this would probably apply to each crop rather uniformly. The income relationship will therefore remain about the same. In analyzing table 4, greatest significance should be attached to income relationships, rather than to individual net-enterprise incomes.

How to use table 4. Let us assume that a comparison of the relative income from soybeans yielding 15 bushels per acre at a farm price of $1.50, and corn yielding 25 bushels at a farm price of 70 cents, is desired. Follow the soybean line indicating a 15-bushel yield across to the right to column headed $1.50, here the estimated enterprise income is $11.73 per acre. Then follow the corn line indicating a 25-bushel yield across to the right to the column headed $0.70, here the estimated enterprise income is $9.22. Such a comparison indicates that on the basis of these yields and prices, soybeans are $2.51 per acre more profitable than corn.

The present price of soybeans for oil is considerably higher than the prices that prevailed before the present world conflict, and perhaps are higher than long-time future prices. Even with lower prices, the soybean-for-oil enterprise gives prospect of good cash returns in relation to competing crops, provided the enterprise is efficiently handled. For example, at $1 per bushel, and with a yield of 20 bushels per acre, soybeans appear to be more profitable by about $2.50 per acre, than 25-bushel corn at 60 cents per bushel (table 4).

This analysis indicates that the soybean-for-oil enterprise has a definite place in the agriculture of the Delta area.

Suggestions for Increasing Yields of and Profits from Soybeans

(1) The soybeans-for-grain enterprise cannot successfully be treated as a mere sideline.

(2) Soybeans to be harvested for grain should not be planted on poorly drained land nor on land that is heavily infested with weeds or Johnson grass.

(3) The seedbed should be thoroughly prepared before the beans are planted.

(4) Soybeans should be planted in rows to permit cultivation and the rows as narrow as cultivating equipment will permit.

Table 4.- Estimates of net-enterprise income, per acre, for soybeans, corn, and oats, with varying yields and prices, Yazoo-Mississippi Delta 1/

Yield per acre	Soybeans: Price per bushel				
	.75	1.00	1.25	1.50	1.75
Bushels	Dollars	Dollars	Dollars	Dollars	Dollars
10	-3.27	- .77	1.73	4.23	6.73
15	.48	4.23	7.98	11.73	15.48
20	4.23	9.23	14.23	19.23	24.23
25	7.98	14.23	20.48	26.73	32.98
30	11.73	19.23	26.73	34.23	41.73
35	15.48	24.23	32.98	41.73	50.48

Yield per acre	Corn: Price per bushel				
	.50	.60	.70	.80	.90
Bushels	Dollars	Dollars	Dollars	Dollars	Dollars
15	- .78	.72	2.22	3.72	5.22
20	1.72	3.72	5.72	7.72	9.72
25	4.22	6.72	9.22	11.72	14.22
30	6.72	9.72	12.72	15.72	18.72
35	9.22	12.72	16.22	19.72	23.22
40	11.72	15.72	19.72	23.72	27.72
45	14.22	18.72	23.22	27.72	32.22

Yield per acre	Oats: Price per bushel				
	.30	.40	.50	.60	.70
Bushels	Dollars	Dollars	Dollars	Dollars	Dollars
30	-2.03	.97	3.97	6.97	9.97
40	.97	4.97	8.97	12.97	16.97
50	3.97	8.97	13.97	18.97	23.97
60	6.97	12.97	18.97	24.97	30.97
70	9.97	16.97	23.97	30.97	37.97
80	12.97	20.97	28.97	36.97	44.97

1/ These income estimates are cash values minus operating enterprise expenses (table 2). They reflect the relative profitableness of each crop but do not represent net profit, as general overhead expenses have not been considered, but overhead costs per acre are essentially the same for each of these crops.

(5) Early maturing varieties are preferable, as they usually mature in time to be harvested before the fall rains begin. A uniformly maturing strain should be selected.

(6) Plant at the rate of 60 to 90 pounds per acre, depending upon quality and germination of seed and do not cover seed over 1 inch deep. If soybeans have not been grown on the land recently, inoculate the seed.

(7) Early planting, April 1 to 15, is desirable.

(8) Cultivate and hoe a sufficient number of times to keep the growing bean plants relatively free of weeds and grass.

(9) Timely harvesting is important. Harvesting should start as soon as the beans will thresh well, and should continue during all favorable days until the entire crop is harvested.

(10) If an acreage that is large in relation to available harvesting equipment is to be harvested, it will probably be advisable to plant two or more varieties with different dates of maturity, or to stagger the planting dates, so as to lengthen the effective harvesting period. Harvesting costs increase greatly late in the season after the fall rains begin.

(11) Combines with auxiliary motors appear to be more satisfactory for harvesting soybeans than combines without motors.

(12) Frequent break-downs and delays in harvesting may be avoided by thoroughly repairing old combines before the harvesting season begins.

(13) When poisoning cotton, extreme caution should be taken to prevent calcium arsenate from settling on soybeans, for it is very injurious to them.

(14) Beans to be stored for a long period should not contain more than 10 percent moisture, and should be placed in well-ventilated bins. Unless in well-ventilated bins, the depth of beans stored in bulk should not be more than 2 or 3 feet. Beans in sacks can be stored at a greater depth. In general, there is less danger of sweating and heating when beans are stored in wooden bins, but they must be well braced to hold soybeans stored in bulk. Perforated and well-ventilated round metal bins have proved to be satisfactory for storing soybeans in the Corn Belt. Additional experimental work relative to storage methods is badly needed in the Delta area.

(15) As the acreage of the oil varieties of soybeans is being expanded rapidly in the Delta, and as many farmers do not have adequate storage for soybeans, the supply of good planting seed is limited. All farmers who have good seed beans should contact their county agents and find out about the needs of others for seed, before selling beans for crushing purposes. Individuals can profitably render a valuable service to the community by not selling their good seed beans for oil until all the needs for seed are supplied.